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To:	USPTO – Mail Stop Certificate of Corrections Branch	**From:**	Jason D. Voight
Fax:	(571) 273-8300	**Pages:**	5
Phone:	(571) 272-1000	**Date:**	April 5, 2006
Re:	Attorney Docket: 50721	**cc:**	

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• **Comments:**

In re Application of:	**MAAS et al.**
Serial No.:	**09/937,815**
Patent No.:	**6,844,290**
Issue Date:	**January 18, 2005**
Title:	**OLIGOMERISATION CATALYST**
Attachments:	**Request for Certificate of Correction** **Certificate of Correction Form PTO/SB/44 (PTO-1050)** **Mark-up copy of Letters Patent**

PATENT

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re application of: MAAS et al.	Art Unit: 1713
Patent No.: 6,844,290 B1	Examiner: C. Caixia LU
Issued: January 18, 2005	Confirmation No.: 5442
For: OLIGOMERISATION CATALYST	Attorney Docket.: 50721

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CERTIFICATE OF FACSIMILE
I hereby certify that this correspondence is being transmitted by facsimile to U.S. Patent and Trademark Office fax no. (571) 273-8300 on April 5, 2006
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REQUEST FOR CERTIFICATE OF CORRECTION

Sir:

Applicants herewith submit a Certificate of Correction Form PTO/SB/44. It is respectfully requested that the Request for Certificate of Correction be entered.

The changes noted on the Certificate of Correction Form PTO/SB/44 correct the errors which occurred on the part of the U.S. Patent and Trademark Office. No fee should therefore be required.

It is not believed that a fee is required for filing of this paper. However, please charge any shortage in fees due in connection with the filing of this paper to Deposit Account No. 14.1437. Please credit any excess fees to such deposit account.

Respectfully submitted,

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Date: April 5, 2006

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PTO/SB/44 (04-05)
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UNITED STATES PATENT AND TRADEMARK OFFICE
CERTIFICATE OF CORRECTION

PATENT NO. : 6,844,290 B1

APPLICATION NO. : 09/937,815

ISSUE DATE : January 18, 2005

INVENTOR(S) : MAAS et al.

It is certified that an error appears or errors appear in the above-identified patent and that said Letters Patent is hereby corrected as shown below:

On the cover page at subsection (63) delete "Continuation-in-part of Application No. 09/277,823, filed on Mar. 29, 1999, now abandoned" and replace with the following paragraph

–The patent claims priority of U.S. application Serial No. 09/277,823, filed March 29, 1999, in accordance with PCT Article 8 and 35 U.S.C. § 119(a) and (b). –

Claim 2, column 15, indicated line 63

"C_7–C_8–arylalkyl" should read -- C_7–C_8–arylalkyl --.

Claim 12, column 18, indicated line 1

"p position" should read –β position–.

MAILING ADRESS OF SENDER (Please do not use customer number below):

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US006844290B1

(12) **United States Patent**
Maas et al.

(10) **Patent No.: US 6,844,290 B1**
(45) **Date of Patent: Jan. 18, 2005**

(54) **OLIGOMERIZATION CATALYST**

(75) Inventors: **Heiko Maas**, Schifferstadt (DE); **Shahram Mihan**, Ludwigshafen (DE); **Randolf Köhn**, Bath (GB); **Guido Seifert**, Berlin (DE); **Jürgen Tropsch**, Römerberg (DE)

(73) Assignee: **BASF Aktiengesellschaft**, Ludwigshafen (DE)

(*) Notice: Subject to any disclaimer, the term of this patent is extended or adjusted under 35 U.S.C. 154(b) by 0 days.

(21) Appl. No.: **09/937,815**

(22) PCT Filed: **Mar. 25, 2000**

(86) PCT No.: **PCT/EP00/02660**

§ 371 (c)(1),
(2), (4) Date: **Sep. 28, 2001**

(87) PCT Pub. No.: **WO00/58319**

PCT Pub. Date: **Oct. 5, 2000**

Related U.S. Application Data

(63) ~~Continuation-in-part of application No. 09/277,823, filed on Mar. 29, 1999, now abandoned.~~ The Patent claims PRIORITY of U.S. Appln. Serial No. 09/277,823 filed March 29, 1999 in accordance with PCT Article 8 and 35 USC 119(a) and (b).

(30) **Foreign Application Priority Data**

May 14, 1999 (DE) 199 22 048
Sep. 11, 1999 (DE) 199 43 544

(51) **Int. Cl.**[7] **C07F 31/18; C07F 11/00**

(52) **U.S. Cl.** **502/167**; 502/103; 502/123; 526/159; 526/172

(58) **Field of Search** 502/103, 123, 502/167; 526/159, 172, 160, 165

(56) **References Cited**

U.S. PATENT DOCUMENTS

5,750,816 A 5/1998 Araki et al. 585/512

FOREIGN PATENT DOCUMENTS

EP 780 353 6/1997

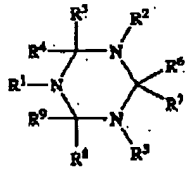
Primary Examiner—Caixia Lu
(74) *Attorney, Agent, or Firm*—Keil & Weinkauf

(57) **ABSTRACT**

An oligomerization catalyst for olefins is obtainable from

a) a chromium compound CrX_3 and the at least equimolar amount, based on the chromium compound CrX_3, of a ligand L or from an existing chromium complex CrX_3L, in which the groups X are, independently of one another, abstractable counterions and L is a 1,3,5-triazacyclohexane of the formula I

I



where the groups R^1 to R^9 are, independently of one another: hydrogen or organosilicon or substituted or unsubstituted carboorganic groups having from 1 to 30 carbon atoms, where two geminal or vicinal radicals R^1 to R^9 may also be joined to form a five—or six-membered ring, and

b) at least one activating additive

and also a process for preparing oligomers of olefins using these catalysts, the oligomers thus obtainable, and the oxo alcohols obtainable from these oligomers.

13 Claims, No Drawings

TABLE 3

Data for Examples 23–26

Ex.	Amount of chromium complex 10 [mg]	[μmol]	Atom ratio Al:Cr	Atom ratio B[1]:Cr	T [° C.]	Monomer	DMP[2] [μmol]	t [min]
23	19.5	29.3	300:1	—	40	C_2H_4[4]	—	60
24	28.3	42.5	50:1[5]	5.3:1	40	1-butene[4]	127.5	60
25	12.1	18.2	500:1	—	50	ethene	—	30
26	55	83	300:1	—	40	200 ml 1-hexene	—	60

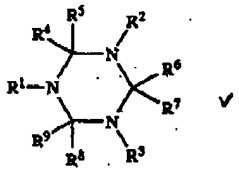
Ex.	Polymer [g]	Product [g] C_6	C_{10}	C_{14}	C_{18}	Activity of the catalyst used [kg/(mol Cr*h)] Polymer	C_6	C_{10}	C_{14}	C_{18}	Total
23	0.43	9.02	10.9	2.06	0.16	14.7	308	372	70	5.5	770
24	—	C_{12}: 2.31				—	C_{12}: 54.3				54.3
25	0.07	6.63	1.96	—	—	3.8	730	215	0	0	945
26	—	C_{10}: 0.24, C_{15}: 2.09				—	C_{10}: 2.9, C_{15}: 25.2				28.1

[1]Activation takes place by addition of DMAB and TIBAL
[2]Triethylaluminum was used instead of TIBAL
[3]2,5-Dimethylpyrrole
[4]Gas was passed through
[5]Use of triethylaluminum

We claim:

1. A catalyst obtained from

a) a chromium compound CrX_3 and the at least equimolar amount, based on the chromium compound CrX_3, of a ligand L or from an existing chromium complex CrX_3L, in which the groups X are, independently of one another, abstractable counterions and L is a 1,3,5-triazacyclohexane of the formula I



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where the groups R^1 to R^9 are, independently of one another: hydrogen or organosilicon or substituted or unsubstituted carboorganic groups having from 1 to 30 carbon atoms, where two geminal or vicinal radicals R^1 to R^9 may also be joined to form a five- or six-membered ring, and

b) at least one activating additive selected from the group consisting of (i) and (ii) wherein:

i) is a combination of an unsubstituted or substituted five-membered aromatic N-heterocycle and at least one aluminum alkyl, wherein some of the alkyl groups of the aluminum alkyl are optionally replaced by halogen and/or alkoxy, and

ii) is an alkylalumoxane.

2. The catalyst defined in claim 1, wherein the groups R^1, R^2 and R^3 in the 1,3,5-triazacyclohexane I are, independently of one another, substituted or unsubstituted C_1–C_{12}-alkyl, C_6–C_{15}-aryl or C_7–C_{19}-arylalkyl.

3. The catalyst defined in claim 1, wherein the groups R^1, R^2 and R^3 in the 1,3,5-triazacyclohexane I are, independently of one another, substituted or unsubstituted C_1–C_{12}-alkyl or C_7–C_8-arylalkyl.

4. [(1,3,5-Tris(2-n-propylheptyl)-1,3,5-triazacyclohexane) $CrCl_3$].

5. [(1,3,5-Tris(2-ethylhexyl)-1,3,5-triazacyclohexane) $CrCl_3$].

6. A process for preparing oligomers having up to 30 carbon atoms by reaction of an olefin or a mixture of olefins at from 0 to 150° C. and pressures of from 1 to 200 bar in the presence of the catalyst defined in claim 1.

7. The catalyst defined in claim 1, wherein the groups R^4, R^5, R^6, R^7, R^8 and R^9 in the 1,3,5-triazacyclohexane I are, independently of one another, hydrogen or methyl.

8. A process as claimed in claim 6, wherein the olefin or mixture of olefins is selected from straight-chain and branched α-olefins having from 2 to 4 carbon atoms.

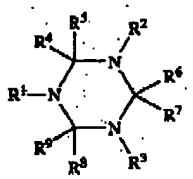
9. A process as claimed in claim 6, wherein the olefin or mixture of olefins is selected from 1-butene and 1-butene in mixture with its isomers.

10. A process as claimed in claim 6, wherein the olefin or mixture of olefins is employed in form of a raffinate comprising 1-butene in mixture with its isomers.

11. A process as claimed in claim 6, wherein the olefin is ethene.

12. A process as claimed in claim 6, wherein the catalyst is obtained from

a) a chromium compound CrX_3 and the at least equimolar amount, based on the chromium compound CrX_3, of a ligand L or from an existing chromium complex CrX_3L, in which the groups X are, independently of one another, abstractable counterions and L is a 1,3,5-triazacyclohexane of the formula I



I

where the groups R^1 to R^9 are, independently of one another:

hydrogen or organosilicon or substituted or unsubstituted carboorganic groups having from 1 to 30 carbon atoms, where two geminal or vicinal radicals R^1 to R^9 may also be joined to form a five- or six-membered ring, and R^1, R^2 and R^3 in part or in whole, and independently of one another, are a group which carries a substituent

attached via a carbon atom, in the R position relative to the nitrogen atom of the 1,3,5-triazacyclohexane ring, and

b) the alkylalumoxane.

13. A process as claimed in claim 12, wherein the olefin is ethene.

* * * * *